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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/660,920	09/13/2003	Wan Zhang	51805	7349

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EXAMINER	
WONG, EDNA	

ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 01/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/660,920	ZHANG ET AL.	
	Examiner	Art Unit	
	Edna Wong	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 November 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11,13-16 and 18-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,13-16 and 18-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *November 14, 2005*.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

This is in response to the Amendment dated November 25, 2005. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Response to Arguments

Specification

The disclosure has been objected to because of minor informalities.

The objection of the disclosure has been withdrawn in view of Applicants' amendment.

Claim Objections

Claim **5** has been objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

The objection of claim 5 under 37 CFR 1.75(c) has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 112

Claims **4 and 5** have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The rejection of claims 4 and 5 under 35 U.S.C. 112, second paragraph, has

been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 103

I. Claims **1-9 and 12** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **JP 11-117100** (JP '100) in combination with **Yanada et al.** (US Patent No. 6,508,927 B2).

The rejection of claims 1-9 and 12 under 35 U.S.C. 103(a) as being unpatentable over JP 11-117100 (JP '100) in combination with Yanada et al. has been withdrawn in view of Applicants' amendment.

II. Claims **10 and 11** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **JP 11-117100** (JP '100) in combination with **Yanada et al.** (US Patent No. 6,508,927 B2) as applied to claims 1-9 and 12 above, and further in view of **Baumgaertner et al.** ("Characterization of Electropolishing Baths with Electrochemical Methods", Galvanotechnik, Vol. 86, No. 2 (no month, 1995), pp. 376-82).

The rejection of claims 10 and 11 under 35 U.S.C. 103(a) as being unpatentable over JP 11-117100 (JP '100) in combination with Yanada et al. as applied to claims 1-9 and 12 above, and further in view of Baumgaertner et al. has been withdrawn in view of Applicants' amendment.

III. Claims **13-17** have been rejected under 35 U.S.C. 103(a) as being unpatentable

over **JP 11-117100** (JP '100) in combination with **Yanada et al.** (US Patent No. 6,508,927 B2).

The rejection of claims 13-17 under 35 U.S.C. 103(a) as being unpatentable over JP 11-117100 (JP '100) in combination with Yanada et al. has been withdrawn in view of Applicants' amendment.

Response to Amendment

Claim Objections

Claim **6** is objected to because of the following informalities:

Claim 6

line 2, the word "or**ht**ophosphoric" should be amended to the word -- or**th**ophosphoric --.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

Claim **5** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5

line 1, "the electronic device" lacks antecedent basis.

Claim Rejections - 35 USC § 103

I. Claims **1-9 and 18-21** are rejected under 35 U.S.C. 103(a) as being unpatentable over **JP 11-117100** (JP '100) in combination with **Yanada et al.** (US Patent No. 6,508,927 B2) and **Duquette et al.** (US Patent No. 6,848,975 B2).

JP '100 teaches a method of electrodepositing a layer of tin or tin-alloy on a substrate, comprising:

electrolytically polishing a substrate (page 1, [0002]) with a solution comprising a phosphoric acid and a carboxylic acid (page 2, [0011]).

The substrate is constructed of a copper-containing metal or metal-alloy (= copper or a copper alloy) [page 1, [0001]; and claim 1].

The substrate is constructed of copper (page 1, [0001]; and claim 1).

The substrate is a printed wiring board substrate, a lead frame, a semiconductor package, a chip capacitor, a chip resistor, a connector, or a contact (page 1, [0002]).

The carboxylic acid is malic acid, tartaric acid, citric acid, lactic acid, or a combination thereof (page 2, [0018]).

The carboxylic acid is a hydroxycarboxylic acid (page 2, [0018]).

The solution further comprises an alkali metal hydroxide (= sodium hydroxide) [pages 2-3, [0022]].

The current density is from 10 to 50 A/dm^2 (= 20-100 A/dm^2) [page 3, [0026]].

The method of JP '100 differs from the instant invention because JP '100 does

not disclose the following:

a. Electrodepositing a layer of tin or tin-alloy on a surface of the treated substrate, as recited in claim 1.

JP '100 teaches forming a *coating* on the electropolished copper or copper alloy by electroplating, which is free of surface blistering, cob and separation which was caused by generated smut (page 1, [0008]; and page 3, [0038]).

Yanada teaches that it has been common practice to perform *tin plating or tin-lead alloy plating*, prior to soldering, on such parts of electronic machines and equipment as chips, quartz crystal oscillators, bumps, connector pins, lead frames, hoops, lead pins of packages and printed circuit boards. The tin plating or tin-lead alloy plating imparts good solderability to various parts or forms a plating film which serves as an etching resist (col. 1, lines 13-20).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the electroplating described by JP '100 by electrodepositing a layer of tin or tin-alloy on a surface of the treated substrate because it has been common practice to perform tin plating or tin-lead alloy plating, prior to soldering, on such parts of electronic machines and equipment as chips, quartz crystal oscillators, bumps, connector pins, lead frames, hoops, lead pins of packages and printed circuit boards. The tin plating or tin-lead alloy plating would have imparted good solderability to various parts or would have formed a plating film which would have served as an etching resist as taught by Yanada (col. 1, lines 13-20).

b. Wherein the electrolytically polishing is at a constant current density and an increasing voltage, as recited in claim 1.

Like JP '100, Duquette teaches electropolishing a copper electronic component (col. 4, lines 1-13). Duquette teaches electropolishing monolithic copper in an aqueous solution of phosphoric acid and deionized water at a constant current density and an increasing voltage. A potential proximate to the center of the voltage range in the C-D region is where stable polishing occurs (col. 5, line 47 to col. 6, line 14; and Fig. 4).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the electroplating described by JP '100 with wherein the electrolytically polishing is at a constant current density and an increasing voltage because a constant current density and an increasing voltage is where stable electropolishing would have occurred as taught by Duquette (col. 5, line 47 to col. 6, line 14; and Fig. 4).

c. Wherein the electronic device substrate is a lead frame, as recited in claim 5.

JP '100 teaches that the copper or copper alloy is made into lead material of electronic parts (page 1, [0002]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the copper or copper alloy described by JP '100 into a lead frame because a lead frame would have been encompassed by the

teachings and/or would have been suggested by the lead material disclosed by JP '100 (page 1, [0002]).

A lead frame is a lead material.

d. Wherein the phosphoric acid is orthophosphoric acid present in the solution an amount of from 20 to 80% by volume, as recited in claim 6.

JP '100 teaches that the phosphoric acid radicals include an orthophosphate (page 2, [0015]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the phosphoric acid radicals described by JP '100 to orthophosphoric acid because orthophosphoric acid would have been encompassed by the teachings and/or would have been suggested by the orthophosphate disclosed by JP '100 (page 2, [0015]) [See also MPEP § 2144.08(II)(A)(4)(c)].

Orthophosphoric acid is an orthophosphate.

As to being present in the solution an amount of from 20 to 80% by volume, JP '100 teaches that the concentration of the phosphoric acid radicals is from 20-120 g/l (page 2, [0017]).

e. Wherein the voltage ranges from 3 to 20 V, as recited in claim 18.

f. Wherein the voltage ranges from 4 to 8 V, as recited in claim 19.

Duquette teaches that the typical current-voltage relationship in electropolishing

varies depending on the electrolyte used and the metal to be polished. The curve would change if the metal and/or electrolyte were changed. A potential proximate to the center of the voltage range in the C-D region is where stable polishing occurs (col. 5, line 47 to col. 6, line 14; and Fig. 4).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the voltage described by JP '100 with wherein the voltage ranges from 3 to 20 V and wherein the voltage ranges from 4 to 8 V because the voltage is a result-effective variable and one skilled in the art has the skill to calculate the voltage that would have determined the success of the desired reaction to occur, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(II)(B).

Changing the metal and/or electrolyte would have changed the current-voltage curve, and thus, would have changed the stable plateau region (C-D region) between an aqueous solution of phosphoric acid and deionized water and an aqueous solution of phosphoric acid and a carboxylic acid.

A changed in the stable plateau region (C-D region) would have likely changed the voltage.

g. Wherein the pH of the solution is from 0 to 3, as recited in claim 21.

JP '100 teaches that the pH is adjusted to *about 5* to 8 (page 2, [0011]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the pH described by JP '100 with wherein the pH

of the solution is from 0 to 3 because it has been held that changes in temperature, *concentration* or both, is not a patentable modification; however, such changes may impart patentability to a process if the ranges claimed produce new and unexpected results which are different in kind and not merely in degree from results of the prior art, such ranges are termed "critical" ranges and Applicant has the burden of proving such criticality; even though Applicant's modification results in great improvement and utility over the prior art, it may still not be patentable if the modification was within capabilities of one skilled in the art; more particularly, where general conditions of the claim are disclosed in the prior art, it is not inventive to discover optimum or workable ranges by routine experimentation. *In re Aller*, 220 F2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) and MPEP § 2144.05.

No new and unexpected results would have been expected between a pH of 3 and a pH of about 5.

II. Claims **10 and 11** are rejected under 35 U.S.C. 103(a) as being unpatentable over **JP 11-117100** (JP '100) in combination with **Yanada et al.** (US Patent No. 6,508,927 B2) and **Duquette et al.** (US Patent No. 6,848,975 B2) as applied to claims 1-9 and 18-21 above, and further in view of **Baumgaertner et al.** ("Characterization of Electropolishing Baths with Electrochemical Methods", Galvanotechnik, Vol. 86, No. 2 (no month, 1995), pp. 376-82).

JP '100, Yanada and Duquette are as applied above and incorporated herein.

The method of JP '100 and Yanada differs from the instant invention because they do not disclose the following:

a. Wherein the solution further comprises an organic solvent, as recited in claim 10.

b. Wherein the organic solvent is ethylene glycol, propylene glycol, glycerin, ethanol, isopropyl alcohol, or a combination thereof, as recited in claim 11.

Baumgaertner teaches that highly efficient electropolishing both in stationary and in dynamic flow cells was observed with baths containing additives such as glycerin, higher alcohols, polyacrylamides, triazole derivatives and thiourea and its derivatives (abstract).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the solution described by JP '100 and Yanada with wherein the solution further comprises an organic solvent; and wherein the organic solvent is ethylene glycol, propylene glycol, glycerin, ethanol, isopropyl alcohol, or a combination thereof because highly efficient electropolishing both in stationary and in dynamic flow cells would have been observed with baths containing such additives as taught by Baumgaertner (abstract).

III. Claims **13-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over **JP 11-117100** (JP '100) in combination with **Yanada et al.** (US Patent No. 6,508,927 B2) and **Duquette et al.** (US Patent No. 6,848,975 B2).

JP '100, Yanada and Duquette are as applied for reasons as discussed above and incorporated herein.

JP '100 also teaches electrolytically polishing a substrate with a solution comprising from 50 to 80% by volume of a carboxylic acid (= 50-150 g/l) [page 2, [0019]].

Citations

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Baier et al. (US Patent No. 2,868,705) is cited to show the current density-voltage relationship in different stages or phases of an electrolytic treatment process (Fig. 2).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Edna Wong
Primary Examiner
Art Unit 1753

EW
January 6, 2006